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Report
of the
Botanical Survey of India
for
1935-36

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Report of the Botanical Survey of India for 1935-36.

I. Systematic.—The officers of the Survey have had little opportunity for outdoor exploration since the advent of retrenchment. But, as has previously been the case, a large number of workers outside the Survey belonging to Universities, the Forest, Agricultural, and other Departments of Government availed themselves of the expert services of the officers at headquarters.

There has been a considerable increase in the number of specimens identified for various correspondents and workers, some 3,500 specimens having been named. That intrepid and veteran explorer, Capt. Kingdon Ward, His Excellency Sir John Anderson, Mr. N. L. Bor of the Forest Department, Assam, and Mrs. Townend are a few among those whose collections have come in for identification. Capt. Kingdon Ward and Mr. N. L. Bor collected in the Naga Hills, while His Excellency made a collection during his visit to Bhutan. A large number of specimens, however, are from Mrs. Townend who has been a very enthusiastic collector in the Sikkim Himalayas. All the above localities, judging from the collections, should yield very interesting facts of distribution, some new species, and not a few first records.

Besides the above, the Locust Research Entomologist, Karachi, Mr. C. E. Parkinson of the Forest Institute, Dehra Dun, Mr. Purkayastha, Forest Department, Assam, Mr. B. N. Tandon of the Allahabad University and several others had their specimens identified by the Department. A considerable number of sheets were received in exchange and presentation from the Lignan University, Canton, the Botanical Garden, *Asiæ Mediæ*, Taschkent and the Singapore Gardens.

Some 421 sheets were on loan this year, comprising the genera *Psilotum*, *Pleurospermum*, *Aganosma*, *Taxocarpus*, *Geniostoma*, *Monotropa*, and others, to Messrs. C. E. Parkinson, C. Norman of the British Museum of Natural History, Y. Tsing of the Sun Yat sen University, Dr. S. P. Agharkar of the Calcutta University, and others. About 754 specimens, which were on loan, were received back from various workers, including J. B. Hutchinson, Dr. H. N. Moldenke of the New York Botanic Garden, The Forest

Botanist, Federated Malay States, and others, with necessary notes incorporated on the sheets.

Plants going out on exchange or presentation include 200 local species to Formosa, 30 specimens of *Phoenix* to America, and a collection of flower buds in special preserving fluid to Sweden. The National Herbarium, Manila and other institutions throughout the world also benefited.

General information on all kinds of subjects, botanical and economic, was supplied to a wide range of correspondents. Among others, information was given regarding *Medicago sativa*, Sabai grass, *Gleichenia* and *Schizaea* species, Citrus, *Piper chabba*, *Taraktogenos Kurzii* and *Hydnocarpus Wightiana*, *Psychotria Ipecacuanha* and Fibre plants. Correct and up-to-date information regarding the herbarium was furnished to Dr. Verdoorn for incorporation in the next annual issue of "Chronica Botanica".

Mr. Biswas, Curator of the Herbarium, botanised about Darjeeling up to Phalute *viâ* Sandakphu and brought to the herbarium about 500 valuable specimens and a good many "Alpine" seeds.

Among foreign visitors who worked in the herbarium, mention should be made of Prof. Tanaka who made a prolonged study of material and literature regarding Citrus. The Curator of the Herbarium has published a few papers, namely, "Jute and Allied Fibres", "Our Garden Sanseverias", "Calcutta Filter Works and Organic Growth", and "Notes on the Systematic Position of Sansevieria growing in India with special reference to *S. Laurentii* Willdem".

The year under review is of special importance as several important resolutions, suggestions, and tentative proposals specially affecting nomenclature and taxonomy have emanated from the Sixth International Botanical Congress held at Amsterdam. The proposed compilation of a new phytography representing the collections in the larger herbaria of the world and the scheme to photograph type specimens of all plants should go far in removing certain handicaps under which all workers, specially monographists, have been labouring. An International Dictionary of Botanical Terminology (though restricted to Phanerogams), translated and explained in English, French, and German, would, no doubt, prove of value in the standardisation of descriptions. Such a work is contemplated. It was also held to be highly desirable that the Linnean type specimens at the Linnean Society and at the British Museum should be photographed, thus making copies available for

distribution to workers in other herbaria. A number of modifications proposed in the international rules of nomenclature have been accepted by the Congress.

Part 10 of the Flora of the Madras Presidency completes the Flora proper. The final part will contain addenda, indices, etc. Mr. Fischer has contributed further notes on Part X, which are calculated to clear many doubtful points. The South Indian grasses, 132 genera, are included in this part, Stapf's generic names being mainly adopted. Several genera of the Flora of British India, like *Panicum*, *Paspalum*, *Pollinia*, *Anthistiria*, *Andropogon*, etc., have been split up into smaller genera after Stapf.

Several new species and new combinations resulted from Prof. Barnes' collections in South India, worked out by Mr. Fischer. Amongst these is *Impatiens anaimudica* C. E. C. Fischer, sp. nov., Travancore, Anaimudi Ridge, 8,000 ft., E. Barnes, allied to *I. travancorica* Bedd. *Arum ovatum* L. and *Lagenandra toxicaria* Dalz., formerly united under the latter name, have had to be separated again as the result of new material furnished by Prof. Barnes. Two species are recognised, *Lagenandra ovata* Thw. and *Lagenandra toxicaria* Dalz.—both from Travancore. The vegetative parts of the two species are very similar, but all the parts are larger in *L. ovata*. A new *Sonerila*, *S. nemakadensis* C. E. C. Fisher, from Barnes' Travancore collection, is also recorded.

Collections made by Capt. Kingdon Ward and Mrs. N. E. Parry in Assam have resulted in the following new species, combinations and first records:—*Vernonia Talaumifolia* Hook. f. et T., var. *hirsutior* C. E. C. Fischer, Garo Hills, Mrs. N. E. Parry; *Veronica cana* Wall., Delei Valley, 6,000 ft., F. Kingdon Ward; *Veronica capitata* Benth., Delei Valley, 11,000 ft., F. Kingdon Ward; *Pinguicula alpina* L., Delei Valley, 10,000 to 11,000 ft., F. Kingdon Ward; *Aeschynanthus deleiensis* C. E. C. Fischer, sp. nov., Delei Valley, F. Kingdon Ward; *Aeschynanthus linearifolia* C. E. C. Fischer, sp. nov., Delei Valley, F. Kingdon Ward; *Elsholtzia Thompsoni* Hook., Garo Hills, 100 ft., Mrs. N. E. Parry; *Celtis sinensis* Pers., Delei Valley, 2,000 ft., F. Kingdon Ward; *Lloydia Forrestii* Diels., Delei Valley, 12,000—13,000 ft., F. Kingdon Ward.

Mr. C. E. C. Fischer has continued his contribution to the Flora of Burma based on the collections of C. E. Parkinson, Kingdon Ward, C. W. D. Kermodé, and others, of which the

following are new species:—*Goniothalamus burmanicus* C. E. C. Fischer, sp. nov. (*Anonaceæ*), North Tonugoo District,, C. E. Parkinson; *Scolopia Kermodi* C. E. C. Fischer, sp. nov. (*Flacourtiaceæ*), Basin District, C. W. D. Kermodi; *Adhatoda oreophila* C. E. Fischer, Comb. nov. var. *magna* C. E. C. Fischer, var. nov. (*Acanthaceæ*), Maymyo Plateau, Gokteik, C. E. Parkinson.

The first part of Volume I of the Flora of Assam has appeared. This is the result of the work of several authors, all Forest Service men. Although it suffers from some of the disadvantages that may be expected of work that has been done in the field and away from herbaria and libraries, it is welcomed as providing the first concise account of part of the Flora of the province. The volume is introduced by an ecological sketch, by a geological account, and by a note on the climatological factors influencing the vegetation. It is bound to serve as a useful work of reference and as a handy companion to all interested in the Flora of this part of India. Especially will it aid the Forest Officer and botanist.

The revision of the Flora of the Bombay Presidency (started by the late Father Blatter) is being continued in the pages of the Journal of the Bombay Natural History Society by Dr. C. McCann. The *Cyperaceæ* is being continued. In the same journal some beautiful Indian trees with coloured illustrations by the late E. Blatter and S. Millard, popular descriptions of *Tecomella undulata*, *Kydia calycina*, *Amherstia nobilis*, *Dillenia indica*, and *Kleinhovia hospita* have appeared.

Volume VIII, No. 6, of the Records of the Botanical Survey brings to completion the Flora Arabica by the late Father Blatter. This volume contains the families Gnetaceæ to Gramineæ and has a general index.

In the Journal of the Indian Botanical Society (XIV, No. 3, pp. 257-263) S. C. Dixit records some species of *Chara* and *Nitella*, chiefly from the Deccan, round about Poona, and Kathiawar, of which one is a new species. In a paper published in the Journal of the Indian Botanical Society (XIV, No. 4, pp. 339-348) Mr. Mukat Behari Raizada has described a number of recently introduced or otherwise imperfectly known plants from the Upper Gangetic Plain. This list may form a sort of supplement to Duthie's Flora of the Upper Gangetic Plain. It has been observed here that some plants indigenous to tropical America are becoming established and naturalised in the region of the Upper Gangetic Plain to an amazing extent. The discovery is in conformity with observations made in the neighbourhood of

Calcutta several years ago. He has also contributed a paper, "The Genus *Psilotum* in India", *Indian Forester*, LXI, No. 10, p. 664, presenting an account of the genus and the distribution of one of the two species known under it. *P. triquatum* alone occurs in India.

Mr. D. B. Mukerjee has contributed notes on a collection of plants from Mahendragiri in the Eastern Ghats, Agency area. Sixty species were collected at 500 ft. above sea level. A preponderance of South Indian Hill Flora over other hill floras was observed. The altitude is said to have its effect on the colour of the floral leaves, epidermal growth, etc. Dr. N. L. Bor made large collections in the botanically little known Balipara Frontier Tract and has given an account of the Conifers growing in this area together with brief notes on climate and geology. Mr. C. E. Parkinson has given an account of some Indian and Burmese *Dillénias* (*Indian Forester*, LXI, No. 7, pp. 447-453). E. G. Baker records a small bushy leguminous plant with yellow flowers from the Salween Gorge, Tibet, collected by Capt. Kingdon Ward. It is allied to *Sophora*, *Caragane*, and *Astragalus*, but differs in certain characteristics.

It is made into a new genus under the name *Salweenia Wardii* Baker.

Hedysarum citrinum from S. E. Tibet with racemes of pale lemon coloured flowers and pods with 3-4 flat glabrous articulations is a new species. *Hedysarum citrinum* sp. nov., S. E. Tibet, 13,500 ft., F. Ludlow and Sherriff. Two new species of *Styracæ* belonging to a new genus, *Huodendron*, are also reported from Tibet in the *Journal of the Arnold Arboretum*, XVI, p. 341 (1935). *Huodendron tebeticum* Alfred Rehder, Genus nov. sp. nov., extreme S. E. Tibet, Coll. C. E. Parkinson. *Huodendron biaristatum* Alfred Rehder, sp. nov., Upper Burma to West of Yunan, Coll. C. E. Parkinson. G. F. Kingdon Ward has given a very interesting account of his 12th expedition in Asia in quest of plants and their seeds. He explored S. E. Tibet, namely, the Salween-Irrawady Divide, Shugdan Gompa, Dri Valley, Delei Valley, and part of the Mishmis. He has also contributed to the *Journal of the Linnean Society*, London, a sketch of the geography and botany of Tibet, being materials for a flora of that country. In the course of the paper he observes that recent botanical exploration has shown that the affinity of the Eastern Himalayan Flora lies almost entirely with Western China across the Tibetan river gorge country. It does not lie with the southern ranges except in a minor degree, although the mountain ranges appear

to be continuous in this direction. Both alpine flora and temperate forest extend east and west in continuous belts. Definite zonal vegetation according to altitude exists here beginning with temperate rain forest and ending with alpine flowers and dwarf shrubs in the higher zones. It is evident that the Flora of Tibet becomes progressive, richer, and more varied as one travels south-eastwards into the river gorge country, where many types of plant associations are met with. The river gorge country is one of the botanical treasure houses of the world.

Another paper giving a pointer to a modern trend in classification is given in the pages of the Journal of Botany (No. 873, Vol. 73, page 241) by Kingdon Ward, regarding *Rhododendron* seeds. Considered from an evolutionary standpoint it can be inferred that seeds are amongst the most stable parts of flowering plants. They do not easily change in response to a changed environment. The author supposes that a study of the seeds may give valuable data in determining the line of descent and so in recognising relationships. Applying the above principle to the classification of *Rhododendrons* he proposes an amendment to Bayley Balfour's system of classification of *Rhododendrons*, where seed characters receive greater attention than hitherto.

Mr. Bharadwaja has reported the occurrence of *Isoetes coromandelina* L. from near Benares where it is said to be extensively spread over a radius of 10 miles. No more than passing mention can be made in this report regarding the ever-increasing number of papers on a wide range of botanical subjects that have emanated from Indian Universities, Colleges, and Institutes. All branches of botany now have their students in this country and the class of work is high.

Mr. P. Maheswari has contributed a paper on the progress of work in India on the embryology of angiosperms wherein he stresses the value to taxonomic classification of a study of the embryology, the wood anatomy, and vascular supply to the floral organs.

Of special importance is the contributions of J. F. Caius in the Journal of the Bombay Natural History Society on the medicinal and poisonous palms of India, followed up by the medicinal and poisonous grasses of India and the medicinal and poisonous ferns.

Mr. J. D. Snowden has given an outline of the classification of cultivated Sorghums. This work was undertaken as a revision consequent on further collections from Africa and Asia at Kew

after Stapf's revision of the cultivated Sorghums of Tropical Africa. The present outline which gives new species, varieties, etc., is a preliminary to a complete revision of the Sorghums.

II. Industrial Section, Indian Museum.—During the year under report the Public Gallery has been enriched by the addition of 356 specimens, which consist mostly of medicinal plant products collected from East Bengal and South India.

The Curator undertook a long tour in the Madras Presidency and Travancore during the year, which resulted in collection of valuable specimens of medicinal plants and their products, fibres and their products, products of cottage industry, food materials, spices, and other miscellaneous articles. He also took this opportunity of collecting herbarium specimens for the Economic Herbarium attached to the Industrial Section, Indian Museum, which has also been enriched by the addition of about 50 sheets.

As usual, a number of herbarium specimens, exhibited in the Gallery, were replaced by coloured drawings of the plants, giving a much better effect to the exhibits.

During the year a number of students of some of the Colleges of Calcutta and the Post-Graduate students of the University of Calcutta visited the Gallery with a view to study the exhibits.

Numerous correspondents in India and abroad were furnished with information on the sources of supply of the Economic Plants and in various cases the plants were identified for them. The number of enquiries by commercial firms and the general public in India regarding the sources of supply of raw materials and finished products considerably increased and they were all satisfactorily dealt with. Further supply of botanical specimens of wild rice from various parts of India was continued for the Kew Herbarium at their request. Authentic specimens of roots of *Aconitum heterophyllum* were supplied to Prof. W. Rae Sheriffs of Southampton for research studies.

The work of general overhauling of the Gallery was continued, resulting in improvements in various directions.

Information on materials of the following was supplied to various correspondents both in India and abroad:—

Acacia arabica Willd.; *Aconitum heterophyllum* Wall.; *Aconitum* sp.; *Alstonia scholaris* Br.; *Amomum aromaticum* Roxb.; *Areca Catechu* L.; *Arenga saccharifera* Labill.; *Atropa Belladonna* L.; *Bambusa* sp.; *Berberis aristata* DC.; *Bahmeria nivea* Hook & Arn.; *Brassica campestris* L.; *Brassica* sp.;

Broussonetia papyrifera Vent.; *Butea frondosa* Roxb.; *Carica Papaya* L.; *Carum Carui* L.; *Cassia* sp.; *Cinchona* sp.; *Citrullus Colocynthis* Schrad.; *Citrus Aurantium* L.; *Curcuma aromatica* Salisb.; *Datura fastuosa* L.; *Dendrocalamus strictus* Nees.; *Derris elliptica* Benth.; *Embelia Ribes* Burm.; *Gardenia lucida* Roxb.; *Holarrhena antidysenterica* Wall.; *Hibiscus Sabdariffa* L.; *Hydrocotyle asiatica* L.; *Indigofera indica* Lamk.; *Mangifera indica* L.; *Nicotiana Tobacum* L.; *Ocimum Basilicum* L.; *Oryza coarctata* Roxb.; *Oryza latifolia* Desv.; *Oryza sativa* L. var. *plena* Prain; *Oxytenanthera* sp.; *Papaver somniferum* L.; *Perilla ocimoides* L.; *Picrorhiza Kurrooa* Benth.; *Piper Betle* L.; *Plantago Psyllium* L.; *Podophyllum Emodi* Wall.; *Psychotria Ipecacuanha* Stokes; *Saccharum ciliare* Anders.; *Saussurea Lappa* Clarke; *Scopalia* sp.; *Sesamum indicum* DC.; *Swertia Chirata* Ham.; *Terminalia Chebula* Retz.; *Thevetia nereifolia* Juss.; *Tinospora cordifolia* Miers.; *Triticum vulgare* Vill.; *Urginea Scilla* Steinh.; *Valeriana Wallichii* DC.

III. Cinchona and Quinine.—*Burma Plantations.*—In the plantation rainfall was normal and there was no damage to Cinchona. No extension was allowed, but the existing blocks were maintained in good condition. Analysis at the Mungpoo Factory shows that age has enriched the Burma bark in quinine content and it compares now very favourably with Munsong bark. During the year under review the harvest of bark was 81,772 lbs., the corresponding figure for 1934-35 being 64,429 lbs. Bark sent to the Mungpoo Factory for extraction was 75,569 lbs. and the stock lying at the plantation at the end of the year was 92,511 lbs.

The shade trees are doing well. The accumulated Ipecacuanha roots are sent to Calcutta and stored at the Indian Museum. Revenue realised from the sale of these roots during the year under review was Rs. 1,760.

Mungpoo Factory.—The recrystallisation of crude quinine to Trade Quinine of B. P. Standard went on as before and the total produce was 17,230 lbs. Its growing popularity is evidenced from its continued sale.

During the year bark received at the Factory from the Burma Plantation for extraction was 75,569 lbs. The total bark treated was 73,078 lbs. (Java 23,341 lbs. and Burma 49,737 lbs.), yielding 2,820 lbs. Quinine Sulphate and 1,379 lbs. Cinchona Febrifuge.

Since the supply of Cinchona Febrifuge from the Presidency Jail, Alipore, to the Government of India area was stopped under orders from the Government of Bengal, indents from the India

15

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Quinine Sulphate Tablets.

Dr.	Lbs.			Cr.
To Stock on 1st April 1935	899	By Sales and other issues .		1,225
„ Manufacture	1,194	„ Stock on 1st April 1936—		
		At Indian Museum	868	
	<u>2,093</u>			<u>2,093</u>

Quinine Reinforced Cinchona Tablets.

To Stock on 1st April 1935	319	By Sales	1,764
„ Manufacture	1,484	„ Stock on 1st April 1936—	
		At Indian Museum	39
	<u>1,803</u>		<u>1,803</u>

Cinchona Febrifuge Tablets.

To Stock on 1st April 1935	Nil	By Sales	155
„ Manufacture	383	„ Stock on 1st April 1936—	
		At Indian Museum	228
	<u>383</u>		<u>383</u>

Cinchona Febrifuge.

To Stock on 1st April 1935	19,687	By Sales and other issues .	6,250
„ Manufacture and returns	1,800	„ Stock on 1st April 1936—	
		At Indian Museum	1,768
		At Mungpoo	13,469
	<u>21,487</u>		<u>21,487</u>

Bark.

To Stock on 1st April 1935	585,231	By Issue for extraction .	73,078
„ Quantity harvested during the year	81,722	„ Stock on 1st April 1936—	
		At Mungpoo	501,364
		At Mergui	92,511
	<u>666,953</u>		<u>666,953</u>

IV. Financial.—The total budget allotment for the year was Rs. 1,53,000, of which Rs. 41,800 was for Botanical Survey proper and Rs. 1,11,200 was for Cinchona. The whole grant was spent,

17

leaving a small saving of about Rs. 2,000 mainly due to modification by audit of the flat rate of extraction of quinine from bark.

V. Staff.—The writer held charge throughout the year as Director, except from 31st May, 1935, to 29th November, 1935, while on leave out of India. During his absence the post of the Director, Botanical Survey of India, was kept in abeyance. Mr. S. C. Sen, Quinologist to the Government of Bengal, who was then the Officiating Superintendent, Cinchona Cultivation in Bengal, discharged the Cinchona duties of the Director. Mr. S. N. Bal performed the duties of the Director at Indian Museum and was placed in immediate charge of the Quinine Stock at Museum under the general supervision of Mr. Sen. Mr. K. P. Biswas, Curator of the Herbarium, Royal Botanic Gardens, Sibpur, who was then officiating as the Superintendent, Royal Botanic Gardens, discharged the Director's duties at Sibpur. Mr. S. N. Bal was Curator of the Industrial Section, Indian Museum.

Mr. V. Narayanaswami, Systematic Assistant, acted as Curator of the Herbarium, Royal Botanic Gardens, Sibpur, under the Government of Bengal from 31st May to 29th November, 1935, and Mr. T. D. Srinivasan, a retrenched officer of this Department, worked in Mr. Narayanaswami's place from 13th August to 29th November, 1935.

Mr. T. C. Mukharjee acted as Head Clerk up to 13th May, 1935, when Mr. A. Banerjee was appointed to officiate in the post. Mr. S. B. Banerji, the Head Clerk, retired from Government service from 1st February, 1936.

On the Cinchona Plantation Mr. G. H. Fothergill acted as Superintendent throughout the year during Mr. P. T. Russell's leave preparatory to retirement. Mr. Mg. Sine was Overseer throughout the year except for a period of three months when Chandra Lal officiated in his place.

All the members of the staff worked well during the year.

C. C. CALDER,

Director,

Botanical Survey of India.

12